

Remarks

Examiner Pham is thanked for the thorough Office Action.

In the Claims

Claims 1, 16, 24, 38, 46, 61 and 69 to 71 were each amended to remove “supporting” at each instance as this limitation is deemed unnecessary in light of the other claims amendments. It is noted that these amendments broaden these claims and reverse such amendments adding “supporting” in the previous office action, returning these claims to their prior state regarding these amendments.

Independent claims 1, 24 and 46 have each been amended to include the limitation “and only a lead-free metal portion interposed between the substrate and the at least one pillar structure”. Support for these amendments may be found, for example, as shown in Figure 7 as filed.

The claims have not otherwise been amended.

No new matter has been added.

Claim Rejections

The Rejection Of Claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 Under 35 U.S.C. §102(b) As Being Anticipated By Kondoh et al. (U.S. Patent No. 5,448,114)

The rejection of claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 under 35 U.S.C. §102(b) as anticipated by Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) is acknowledged.

According to the section 2131 of the MPEP "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." Verdegaal Bros. vs. Union Oil Co. of California, 814 F. 2d 628, 631 2 USPQ2d 1051, 1053 (Fed. Cir. 1987).

Applicants' wish to briefly point up the claimed features of their invention which are believed to be not shown nor obvious from the teachings of known references in this field. The claims (including independent claims 26 and 46) (using independent claim 1 as a template) all clearly define "[a] die comprising: (1) a substrate; and (2) two or more different types of pillar structures formed over the substrate in a pattern; at least one of the two or more different types of pillar structures a lower high-melting-point non-solder supporting portion and an upper solder material portion over

and in substantial contact with only an upper surface of the lower high-melting point non-solder ~~supporting~~ portion; and only a lead-free metal portion interposed between the substrate and the at least one pillar structure; wherein the lower high-melting-point non-solder ~~supporting~~ portion does not melt during a reflow process to form the two or more different types of pillar structures.” (emphasis added)

Thus, at least one of the two or more different types of instantly claimed pillar structures has a “high-melting-point non-solder ~~supporting~~ portion” (pillar portion) and an upper solder portion (solder portion) “over and in substantial contact with only an upper surface of the lower high-melting point non-solder ~~supporting~~ portion; and only a lead-free metal portion interposed between the substrate and the at least one pillar structure; ...”.

The Examiner states (removing “supporting” at each instance) that Kondoh “discloses a die comprising:

(*providing*) a substrate 1; and

(*forming*) two or more different type of pillar structures 3 and 4 formed over the substrate 1 in patterns (figs. 1-4, e.g.);

at least one of the two or more different types of pillar structures includes a lower *high-melting-point non-solder* portion 53 and an upper *solder-material* portion 54 over and in substantial contact with only an upper surface of the lower *high-melting point non-solder* portion 53 (fig. 11);

wherein the lower *high-melting-point non-solder* portion 53 does not melt during a reflow process to form the two or more different types of pillar structures.”

While Applicant’s attorney maintains the position and prior arguments that in the Kondoh patent both the wall member 3 and the bump 4 are not the "pillar structures" as previously claimed, the current amendments to the claims have been made to expedite prosecution of the application.

As instantly claimed, “only a lead-free metal portion interposed between the substrate and the at least one pillar structure” is now a limitation in each of the independent claims. However, Kondoh does not disclose this as discussed below.

Instead, Kondoh, at Figure 11 and the related specification, discloses “... a first barrier layer 51 of three-layer structure of titanium-nickel-gold is formed” on the electrode pad 5 that is in turn formed on a semiconductor chip 1. “On the first barrier layer [51 of a three-layer structure of titanium-nickel-gold], a ... first supporting layer 52 of lead, ... a ... a second barrier layer 53 of copper or palladium, and a ... supporting layer 54 made of an alloy containing 40% by weight of lead and 60% by weight of tin are stacked in that order.”

The Examiner has defined “second barrier layer 53” as the “lower high-melting point non-solder portion” as instantly claimed and “supporting layer 54” as the upper solder-material portion over and in substantial contact with only an upper surface of the lower high-melting point non-solder portion ...” Ergo, in Kondoh, what is interposed (that is between) the Kondoh substrate 1 and the at least one pillar structure (which the Examiner has defined in Kondoh as lower portion 53 and upper portion 54), is barrier layer 51 (titanium-nickel-gold) **and first supporting layer 52 of lead.** (emphasis added)

Thus Kondoh does not disclose “only a lead-free metal portion interposed between the substrate and the at least one pillar structure” as instantly claimed. Therefore, the claimed invention should be novel under 102(b) over Kondoh as it does not disclose, inter alia, “only a lead-free metal portion interposed between the substrate and the at least one pillar structure” as instantly claimed in independent claims 1, 24 and 46, and thus in depending claims 2, 9, 11 to 13, 19, 31, 33 to 35, 41, 47, 54, 56 to 58, 64 and 69 to 71.

The Rejection Of Claims 3 to 8, 10, 16, 20 to 23, 25 to 30, 32, 38, 42 to 45, 48 to 53, 55, 61 and 65 to 68 Under 35 U.S.C. §103(a) as Being Unpatentable Over Kondoh et al. (U.S. Patent No. 5,448,114) As Applied To Claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46,

47, 54, 56 to 58, 64 and 69 to 71 Above, And Further In View Of Lee et al. (U.S. Patent No. 6,642,136 B1)

The rejection of claims 3 to 8, 10, 16, 20 to 23, 25 to 30, 32, 38, 42 to 45, 48 to 53, 55, 61 and 65 to 68 under 35 U.S.C. §103(a) as being unpatentable over Kondoh et al. (U.S. Patent No. 5,448,114) (the '114 Kondoh Patent) as applied to claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 above, and further in view of Lee et al. (U.S. Patent No. 6,642,136 B1 (the '136 Lee Patent) and the following reasons is acknowledged.

§103 Rejections - Overview Analysis

According to the MPEP section 2142 regarding §103, "The examiner bears the initial burden of factually supporting any prima facie conclusion of obviousness...". Further,

To establish a prima facie case of obviousness, three basis criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on the applicant's disclosure.

However, neither Kondoh alone, nor Kondoh as applied to claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 and further in view of Lee, disclose or fairly teach, alone or in the combination, inter alia, the claimed limitation "only a lead-free metal portion interposed between the substrate and the at least one pillar structure interposed between the substrate and the at least one pillar structure" in combination with the other claimed limitations. Lee does not cure the deficiencies of Kondoh as discussed above, for example.

Thus claims 3 to 8, 10, 16, 20 to 23, 25 to 30, 32, 38, 42 to 45, 48 to 53, 55, 61 and 65 to 68 are not obvious over Kondoh under §103(a) and claims 3 to 8, 10, 16, 20 to 23, 25 to 30, 32, 38, 42 to 45, 48 to 53, 55, 61 and 65 to 68 are not obvious over Kondoh as applied to claims 1, 2, 9, 11 to 13, 19, 24, 31, 33 to 35, 41, 46, 47, 54, 56 to 58, 64 and 69 to 71 and further in view of Lee under §103(a).

Therefore claims 1 to 13, 16, 19 to 35, 38, 41 to 58, 61 and 64 to 71 are submitted to be allowable over the cited references and reconsideration and allowance are respectfully solicited.

CONCLUSION

In conclusion, reconsideration and withdrawal of the rejections are respectively requested. Allowance of all claims is requested. Issuance of the application is requested.

It is requested that the Examiner telephone Stephen G. Stanton, Esq. (#35,690) at (610) 296 - 5194 or the undersigned attorney at (845) 452 - 5863 if the Examiner has any questions or issues that may be resolved to expedite prosecution and place this Application in condition for Allowance.

Respectively submitted,

A handwritten signature in black ink, appearing to read 'SBA', is written over a horizontal line.

Stephen B. Ackerman
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